CLIMATOLOGICAL DATA FOR OCTOBER, 1911.

DISTRICT NO. 9, COLORADO VALLEY.

FREDERICK H. BRANDENBURG, District Editor.

GENERAL SUMMARY.

October was colder and much wetter than the average throughout the Colorado Basin. Departures from normal weather conditions are usually not a serious matter in this district, but during October, 1911, all records for destruction of property in the district due to such causes were broken. Had the precipitation in the San Juan Basin come in the way common to October—that is, in the form of snow, instead of rain, in the high mountain regions—several lives would not have been lost, and property estimated at $1,000,000 would not have been destroyed. Downpours of rain during the warmer months of the year from local thunderstorms are expected occasionally in the mountains, but the areas affected are usually small. With the coming of autumn, thunderstorms give way to general storms that spread their influence over a wide scope of country, causing sharp falls in temperature and occasional heavy snowfalls. On October 4 and 5, instead of these last-named conditions, mild temperatures prevailed as high as or higher than timber line, permitting precipitation in the form of rain rather than snow, the usual accompaniment of storms of this character at high levels. Heavy snowfalls may cause inconvenience and interrupt traffic for a short time, but there is no instance where 2 days of snowfall has blocked railroads for 6 weeks, as has been caused by rain in this case on one line into Durango, Colo. Details of the damage caused by this remarkable storm on the San Juan watershed will be found in another column. On the adjacent drainage areas in the district heavy rains also occurred, and there was some loss of bridges and damage to trails and roads. From the 26th to the 29th stormy weather was again general, with heavy rainfall in localities in Arizona and western New Mexico. In these localities, however, the fall was quite beneficial in reviving the grass on the ranges and replenishing the water holes. Apart from the few stormy days, weather conditions during October were favorable.

TEMPERATURE.

The mean of the 150 stations reporting was 52.7°, or 1.5° below the normal. By subdivisions the means and departures were: Western Wyoming, 37.5°, −2.2°; western Colorado, 42.1°, −2.1°; eastern Utah, 47°, −1.2°; western New Mexico, 53°, −1.2°; Arizona, 61.9°, −1.3°; and southeastern Nevada, 56.6°. The highest monthly mean was 74° at Mohawk Summit, Ariz., and the lowest, 25.2°, at Corona, Colo. Over the greater part of the area not in the mountains the first 6 days were cooler than the normal; then followed nearly 2 weeks with temperatures above the normal in Arizona, while weather somewhat cooler than the normal prevailed in the remainder of the district. A cold snap was general from the 20th to 23d, inclusive. During this period the lowest temperatures of the month were generally noted. The succeeding days, which were slightly warmer than the normal, were followed by cool weather. The highest temperature, 105°, was noted at Casa Grande, Ariz., and readings of 100° or higher were noted at 5 other stations in Arizona. The lowest temperature, −17°, was noted at Dillon, Colo., on the 21st; 5 other stations, all in Colorado, reported readings below zero on the same date.

PRECIPITATION.

The average for the 196 stations reporting was 2.59 inches, or 1.30 inches above the normal. The average for October, 1910, was 1.00 inch. By watersheds the averages and departures were: Green, 1.42, +1.06; Grand, 2.36, +1.19; San Juan, 4.04, +1.77; Little Colorado, 2.12, +1.24; Gila, 2.16, +1.41; Mimbres, 2.18, +0.74; and Colorado proper, 0.80, +0.27 inch. The greatest monthly amount was 10.65 inches at Gladstone, Colo., elevation 10,400 feet. Of this amount 8.05 inches fell on the 5th. A large number of stations reported excessive precipitation.

The snowfall occurred toward the close of the month and was confined to high-level stations in Colorado and 1 station in Utah. Monthly amounts of 10 inches or more were noted at 6 stations in Colorado.

The average number of days with 0.01 inch or more of precipitation was 4 in western Wyoming; 6 in western Colorado; 4 in eastern Utah; 5 in western New Mexico; 4 in Arizona; and 1 in southeastern Nevada; and for the district as a whole 5 days.

MISCELLANEOUS.

The amount of sunshine reported was as follows: Grand Junction 76 per cent of the possible; Durango 78; Flagstaff 81; Phoenix 80; and Yuma 93.

The relative humidity was above the average, except in the southwestern part of Arizona. The following values were reported: Grand Junction 60, Durango 63, Flagstaff 59, Phoenix 50, and Yuma 42 per cent.

FLOODS IN SOUTHWESTERN COLORADO AND NORTHWESTERN NEW MEXICO.

FREDERICK H. BRANDENBURG, District Forecaster.

The worst flood since the settlement of the country occurred in the Dolores and San Miguel Rivers in western Colorado, the San Juan River and its tributaries, the upper Rio Grande in Colorado, and the tributaries of the Rio Grande in northwestern New Mexico on October 5 and 6, 1911. Heavy local downpours have occasionally occurred in the mountains during the latter part of summer, causing severe floods of short duration over limited areas, but there is no previous record, or even tradition, among the Indians of such severe floods occur-

ring simultaneously in all the streams of southwestern Colorado and northwestern New Mexico.

The floods were caused by torrential rains throughout the district, more particularly in the high mountain areas, where, under normal temperature conditions, precipitation after the middle of September is in the form of snow, which remains till spring. The San Juan Mountains, which are a part of the Continental Divide, form the watershed between the upper Rio Grande on the east, the San Juan on the south, and the Gunnison on the north. It was in this region that the storm was most severe. In general, the rains began during the forenoon of the 4th, becoming heavy during the night, and continuing heavy until late in the afternoon of the 5th. There is evidence that the rainfall increased with altitude. The effect of rainfalls of 2½ inches to more than 8 inches on the steep slopes of the San Juan Mountains was to cause quickly forming floods that swept everything in their path. Five lives were lost; miles of railroad tracks were destroyed; scores of bridges were carried away; and there was a general destruction of crops, of farm lands by immense deposits of silt or by erosion, wagon roads, trails to the mines, irrigating ditches, flumes, and other mining equipment. The Denver & Rio Grande Railroad Co., which includes the Rio Grande Southern, estimates that from $400,000 to $500,000 will be required to restore its bridges and roadbed. The damage to other interests is variously estimated, and will probably reach $500,000, and it will be months before normal conditions of travel will be restored.

FLOOD IN THE SAN JUAN.

The trunk stream rises in the southeastern part of Mineral County, Colo., and flows southwestward through Archuleta County, and thence westerly in San Juan County in northwestern New Mexico. Its tributaries, Piedra, Pine, Animas, with its tributary, the Florida, the La Plata and Mancos are similar as regards length, and the character of the region drained, namely, a mountainous country ranging in altitude from 14,000 to 6,000 feet, with the gradient southward to the San Juan River. On this drainage area moderate but persistent rains fell for a number of days prior to the coming of the torrential rains. In Archuleta County, on the 4th and 5th, rainfalls of 2.50 to 3.82 inches occurred; in La Plata County, from 3.40 to 3.52 inches; and in San Juan County, from 2.59 to 8.05 inches. On its southern drainage in New Mexico the rainfall on these 2 days was from 2 to 4 inches. In southeastern Utah the rainfall ranged from 1.11 to 5.05 inches, while farther north, where the drainage is into the Grand River, it was from 1.76 to 2.28 inches.

At Arboles, located at the junction of the Piedra and the San Juan, the destruction was almost complete. Every bridge on the Pine, with the exception of the Government bridge at the Indian agency and the railroad bridge at La Boca, were washed away. The 2 bridges left standing had the approaches destroyed. Ignacio and Bayfield were flooded, and much damage was sustained. The steel wagon bridge at Ignacio was carried away, as were all bridges between Ignacio and Bayfield.

Apart from the Denver & Rio Grande Railroad Co., the worst sufferers by the flood in the Animas Valley were the ranchmen. During the night of the 5th running water covered the valley, and hay, grain, and other crops were carried away, and in the vicinity of Hermosa much land was injured by washing. The San Juan Water & Power Co. suffered a damage of almost $10,000, the entire transmission line in the Animas Canyon being destroyed. In the upper part of the Animas watershed the Red Mountain-Silverton Railroad was damaged, probably to the extent of $25,000. The Silverton, Gladstone & Northern also sustained great damage.

Mr. Wayland Bailey, in charge of the local office of the Bureau at Durango, has furnished the following report of the flood in the vicinity of Durango:

On October 4, 1911, light rain began at 10.47 a. m.; 0.12 of an inch fell up to 6 p. m.; it became heavy after sunset, and 2.08 inches we measured at 6 a. m. on the 5th; it continued with but slight interruptions until 6.48 p. m., 1.22 inches more being recorded; the total was 3.42 inches in 32 hours. The rainfall was probably heavier in the mountains. All streams were out of their banks.

On the 5th the bridge on Main Avenue over Junction Creek was washed away, and the railroad bridge over the same was torn from its piers.

During the night the Animas River at the Main Avenue bridge rose about 3 feet higher than during the flood of 1909; water to the depth of 5 feet flowed over Main Avenue near Fifteenth Street, washing out the sides of the avenue and destroying the sidewalks. The city footbridge at Fourteenth Street and the footbridge at the smelter were swept away, and the eastern approach to the bridge of the Rio Grande Southern Railroad was washed out, and one span of the bridge of the railroad to Silverton was carried downstream for a short distance, though two heavily laden coal cars were on it.

Near the Main Avenue Bridge one house and two barns were carried away and other houses were flooded with water and mud. On Mexican Flats the houses were flooded and several small houses went down the stream. The damage is estimated at $25,000 besides that to railroads. The pipe line which supplied the city reservoir with water was washed out at the headgate and for some distance below.

In La Plata County nearly all the wagon and railroad bridges were washed out, many of the former and some of the latter being carried away entirely. It is estimated that the damage to the roads and wagon bridges of the county is about $100,000. There was no loss of life in this county.

In the upper reaches of the trunk stream the crest occurred at 10 a. m. of the 5th, at Pagosa Springs; at Aztec, in San Juan County, some time after midnight, and at Shiprock, at 3 p. m. of the 6th. Mr. E. T. Walker, cooperative observer, has furnished the following account of the flood in the vicinity of Pagosa Springs:

The precipitation beginning at 1 p. m. on the 4th, and ending at 11 a. m. on the 5th, totaling 3.82 inches, resulted in the most disastrous flood known within the memory of the oldest inhabitants—Indian, Mexican, or American. The precipitation of the previous few days, viz, September 29, 0.30, September 30, 0.62, October 1, 0.33 inch, had thoroughly soaked the ground, and much of the water ran off. Owing to the constant changing of the channel of the river at this place it is difficult to gage the rise of the flow with any degree of accuracy, but it is safe to say that twice as much water passed here on the 5th as has ever flowed in any single 24 hours of the 32 years that I have resided on the banks of the San Juan. The precipitation was general throughout the county and resulted in much damage to ranches, roads, bridges, irrigating ditches, railroads, etc.

Two ranch and stock men, Mr. J. C. Dowell and his son-in-law, Mr. Turner, neighbors of mine, lost their lives in Mill Creek, a small tributary of the San Juan. Twenty or more residences and barns were swept away in the town of Pagosa Springs, and many others were moved from their foundations and wrecked. Only one wagon bridge is left in the county, and many of the irrigation ditches will have to be rebuilt, and not a single headgate is left.

Owing to excessive rains during the summer and fall, ranchmen were delayed in haying and harvesting their grain, all of the latter and a great deal of the former being in the shock, and all on low lands, amounting to fully a third of the county's production, was a total loss. I doubt whether the present channel of the San Juan through the county flows in its original channel to the extent of a single mile. The cottonwood groves were swept from bluff to bluff, and trees lie in drifts from 5 to 10 feet high.

News of the flood in the upper parts of the different watersheds was communicated to the downstream points, permitting the taking of steps to minimize as far as possible the damage. Along the San Juan, proper, practically every bridge was washed away, and hundreds of acres of orchards were badly damaged; the Methodist Mission, 3 miles west of Farmington, was destroyed,

and one man, John Pice, was drowned. In the lower reaches, at the Shiprock Indian School, the water was 4 or 5 feet over the grounds, and seven adobe buildings with contents were destroyed. At 2 p. m. the gage height was 22 feet; at 3 p. m. the Government bridge went out. The water then subsided slowly until evening, when it had fallen 2 feet. By Saturday morning it was down to the high-water mark of July 20. The damage at the Indian school, including the bridge, is placed at $50,000.

At the time of the floods in the San Juan, similar conditions obtained in the Dolores and San Miguel Rivers, and in a less degree in the Gunnison and the Grand. The resultant of the combined flows in the Colorado River, probably amounting to 150,000 cubic feet a second, reached Topock, near Needles, on the 11th, when the gage indicated a stage of 17.8 feet. At Yuma the crest, 24.2 feet, was reached on the 14th.

At Rico, on the Dolores, 11 dwellings, 1 livery stable, and the city feed yards were washed away on the 5th, and at 8 p. m. of the same date the river overflowed its banks at Dolores, and following the river bed of years ago, swept in a torrent through the town. The roadbed of the Rio Grande Southern Railroad was washed out, and many wagon and railroad bridges were carried away. Similar damage occurred along the San Miguel.

On the Colorado, of which the San Juan is one of its important tributaries, the only damage, in the vicinity of Parker, Ariz., was done to crops, estimated at $1,000. In the vicinity of Needles the principal damage was the breaking of the Cotton Land Co.'s levee on the Arizona side. The water company spent several hundred dollars in trying to prevent further erosion toward their plant. The river as a whole was on an average 18 inches higher both at Needles, Cal., and on the Arizona side, than during the spring floods.